

KERATINOPHILIC FUNGI ASSOCIATED WITH HUMAN HAIR IN YEMEN

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ABSTRACT - 28 species and 2 species varieties belonging to 13 genera were collected from 50 human hair samples collected from Yemen. The most common genera were *Aphanoascus*, *Aspergillus* and *Chrysosporium*. Several keratinophilic fungi were recovered, but with variable counts and frequency such as *Aphanoascus fulvescens* (= *Chrysosporium keratinophilum*), *Aphanoascus* species (= *C. tropicum*), *A. terreus* (= *C. indicum*), *Chrysosporium carmichaelii*, *C. Lucknowense*, *C. asperatum*, *C. pruinatum*, *C. xerophilum*, *Arthroderma cuniculi* (= *Chrysosporium* anamorph of *Arthroderma cuniculi*), *A. lenticulare* (= *Trichophyton terrestre*), *A. ciferii* (= *C. georgii*), *Apinisia queenslandica* (= *C. quessnslandicum*) and *Microsporium gypseum*. Also several other saprophytic and cycloheximide resistant fungi were isolated.

KEY WORDS - Keratinophilic fungi, cycloheximide resistant fungi, human hair.

Keratinophilic fungi are mostly isolated from soil and human or animal tissue, especially from keratinous areas of the body such as the skin hair or nails. Different authors have reported the finding of keratinophilic fungi in human skin of patients (Mariat *et al.*, 1967; Lopez-Marting *et al.*, 1978; James & Katherine, 1984; Ogbonna *et al.*, 1985).

In Egypt Moharram *et al.* (1988) studied the frequency of fungi on the hair samples from human, but there are no records available on dermatophytes on human hair in Yemen. Hence the aim of this paper was to characterize the fungus flora of human hair in Yemen.

MATERIALS AND METHODS

Fifty samples of human hair were collected from different localities of Yemen and were screened for their content of keratinophilic fungi. Keratinophilic were isolated using the soil plate technique. The soil was double-sterilized by autoclaving at 121°C for 30 min. The hair samples were placed on the sterile soil moistened with sterile distilled water and remoistened whenever necessary and incubated at room temperature for up to 10 weeks. The moulds which appeared on the baits were transferred to the surface of Sabouraud's dextrose agar medium (Moss & McQuown, 1969) containing 0.5% of each of cycloheximide and chloramphenicol. Plates were incubated at 28°C for 14 days and the developing fungi were isolated and identified.

Table I - Numbers of cases of isolation (out of 50% samples), percentage frequency and occurrence remarks of fungal genera and species recovered from human hair.

Genera and species	NCI	F	OR
<i>Aphanoascus</i>	37	74	H
<i>A. fulvescens</i> (Cooke) Apinis	23	46	M
<i>Aphanoascus</i> sp.	22	44	M
<i>A. terreus</i> (Randhawa & Sandhy) Apinis	16	32	M
<i>Aspergillus</i>	23	46	M
<i>A. flavus</i> Link	14	28	M
<i>A. flavus</i> var. <i>columnaris</i> Raper & Fennell	12	24	L
<i>A. niger</i> van Tieghem	7	14	L
<i>A. ustus</i> (Bainier) Thom & Church	5	10	R
<i>A. wentii</i> Wehmer	4	8	R
<i>Chrysosporium</i>	17	34	M
<i>C. armichaelii</i> van Oorschot	9	18	L
<i>C. lucknowense</i> Garg	6	12	R
<i>C. asperatum</i> J.W. Carmichael	5	10	R
<i>C. pruinatum</i> Gilman & Abbott	4	8	R
<i>C. xerophilum</i> Pitt	2	■	R
<i>Penicillium</i>	10	20	L
<i>P. funiculosum</i> Thom	8	16	L
<i>P. chrysogenum</i> Thom	4	8	R
<i>P. puberulum</i> Bainier	3	6	R
<i>Arthroderma</i>	■	16	L
<i>A. cuniculi</i> Dawson	4	8	R
<i>A. lenticulare</i> Pore, Tsao & Plunkett	3	6	R
<i>A. ciferrii</i> Varsavsky & Ajello	2	4	R
<i>Alternaria</i>	5	10	R
<i>A. alternata</i> (Fries) Keissler	4	8	R
<i>A. raphani</i> Grosves & Skolko	3	6	R
<i>Emericella</i>	5	10	R
<i>E. nidulans</i> var. <i>dentata</i> Sandhu & Sandhu	4	8	R
<i>E. nidulans</i> (Eidam) Vuillemin	2	4	R
<i>Cunninghamella</i>	4	8	R
<i>C. echinulata</i> Thaxter	4	■	R
<i>C. elegans</i> Lendner	3	6	R
<i>Rhizopus stolonifer</i> (Ehrenb.) Lind.	4	8	R
<i>Apinisia queenslandica</i> Apinis & Rees	3	6	R
<i>Mucor racemosus</i> Fresenius	3	6	R
<i>Torula herbarum</i> (Pers.) Link	3	6	R
<i>Microsporum gypseum</i> (Bodin) Guiart & Grigorakis	1	2	R

Occurrence remark: H= high occurrence; between 25 to 50 cases (out of 50 samples). M= moderate occurrence; between 13 to 24 cases. L= low occurrence; between 6-12 cases. R= rare occurrence; between 1 to 5 cases.

RESULTS AND DISCUSSION

Twenty-eight keratinophilic and cycloheximide resistant species in addition to 2 varieties which belong to 13 genera were collected from 50 human hair samples (Table 1).

Aphanoascus (= *Chrysosporium*) was the most common genus, occurring in 74% of the samples. It was represented by 3 species, of which *A. fulvescens* (= *C. keratinophilum*) was the most common species and was represented in 46% of the hair samples. *C. keratinophilum* emerged in 5% of the hair samples from Egypt (Moharram *et al.*, 1988), from 72% of nails samples in Egypt (Abdel-Hafez *et al.*, 1990), from 71.7% of camel and goat hair samples from Al-Arish, Egypt (Bagy & Abdel-Hafez, 1985), *C. keratinophilum* and *C. tropicum* were isolated from human ears in Egypt by Abdel-Hafez (1990).

Aphanoascus species (= *C. tropicum*) was the second most frequent fungal species and was encountered in 44% of the hair samples tested. It was dominant species in human hair samples in Egypt (21% of the samples) as recorded by Moharram *et al.* (1988). It was also represented in 42.5% of camel and goat hair samples from Egypt (Bagy & Abdel-Hafez, 1985). In Gaza Strip, *C. tropicum* occurred in 36.4% of sheep hair samples tested (Abdel-Hafez, 1987). This species was isolated from mammals in Australia (Rees, 1967), Venezuela (Morales *et al.*, 1967) and India (Guganani *et al.*, 1975). Bagy (1986) reported that *C. tropicum* was the second most frequent fungal species on dog (11.2% of the samples), donkey (10.6%) and cow hairs (3.9%) from Upper Egypt.

Aphanoascus terreus (= *C. indicum*) was the third most frequent species and was represented in 32% of the soil samples. Bagy & Abdel-Hafez (1985) isolated this species from camel (8.3%) and goat (20%) hairs from Egypt. *C. indicum* emerged from 29.1% and 25.5% of the goat and sheep hair samples collected from Gaza Strip (Abdel-Hafez, 1987).

Aspergillus was the second most frequent genus and was encountered in 46% of the samples tested. From the genus 4 species and 1 variety were collected of which *A. flavus*, *A. flavus* var. *columnaris* and *A. niger* were the most common. The remaining *Aspergillus* species were scarcely recovered and these were *A. ustus* and *A. wentii*. All preceding species, except *A. wentii* were recovered, but with variable frequencies of occurrence from human hair samples in Egypt (Moharram *et al.*, 1988). Aspergillosis due to *A. fumigatus* and *A. flavus* has a world-wide distribution (Frey *et al.*, 1979). *A. flavus*, *A. fumigatus*, *A. nidulans* and *A. sydowii* were recorded from hair of large mammals in Egypt (Bagy, 1986).

Chrysosporium occupied the third place with regard to the number of cases of isolation and it recovered from 34% of the samples examined. Five species of *Chrysosporium* were isolated and these were *C. carmichaelii* (18%), *C. lucknowense* (12%), *C. asperatum* (10%), *C. pruinatum* (8%) and *C. xerophilum* (4%). All the previous *Chrysosporium* species were isolated, but with variable frequencies of occurrence, from the soil samples from Yemen (El-Said, 1993). De Vroey (1976) mentioned that species of *Chrysosporium* are occasionally isolated in the clinical laboratory from skin, hair or nails.

Penicillium occupied the fourth place according to the number of cases of isolation of fungal genera and it encountered in 20% of the hair samples. Three species of *Penicillium* were isolated and these were *P. funiculosum* (16%), *P. chrysogenum* (8%) and *P. puberulum* (6%). In Egypt, all the previous species were isolated from human hair samples (Moharram *et al.*, 1988). El-said (1993) isolated also all of the above species from soil samples from Yemen.

Arthroderma encountered from 16% of the samples tested. From the genus, 3 species were collected of which *A. cuniculi* (= *Chrysosporium* anamorph of *Arthroderma cuniculi*) was common and recovered from 8 % of the samples. *A. lenticulare* (= *Trichophyton terrestre*) and *A. ciferrii* (= *C. georgii*) were less frequent. All the above species were previously isolated from claws of buffalo and cow in Egypt by Abdel-Gawad (1989). Abdel-Hafez *et al.* (1990) isolated *Chrysosporium* anamorph of *Arthroderma cuniculi* 1.3% from horns samples of goat, *Trichophyton terrestre* 2.5% and *Chrysosporium georgii* 2.5% from the colven-hooves samples of sheep. El-Said (1993) isolated *Arthroderma cuniculi* from 12% of the soil samples collected from Yemen.

Alternaria emerged in 10% of the hair samples examined. It was represented by 2 species, they were *A. alternata* and *A. raphani*. Moharram *et al.*, 1988 isolated *A. alternata* from 11% of human hair samples collected from Upper Egypt. These species were encountered in rare frequency from Yemenian soil (El-Said, 1993). Abdel-Hafez (1990) isolated *A. alternata* from human ears in upper Egypt.

Among the remaining isolated 7 genera and 9 species were recovered in rare frequencies, *Microsporium gypseum* was the sole true dermatophyte species. It was encountered in 2% of the samples. This species is a causal agent of tinea capitis, tinea corporis and tinea pedis in man and ringworm in animals (Frey *et al.*, 1979).

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